SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-40

Name: Lake Herman **County**: Lake
Legal Description: T106N- R53W- Sec.10-11,14-15, 22-23
Location from nearest town: 2 miles west of Madison, SD.

Dates of present survey: June 18-20, 2007, September 18, 2007 (electrofishing)
Dates of last survey: June 20-22, 2005, September 13, 2005 (electrofishing)
Most recent lake management plan: F-21-R-28 (January 1, 1995-December 31, 1999)
Management classification: Warmwater Marginal

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	Common Carp
Black Crappie	Bluegill
Black Bullhead	White Sucker
	Bigmouth Buffalo
	White Bass

PHYSICAL DATA

Surface area when full: 1,287 acres **Watershed area**: 36,275 acres
Maximum depth when full: 13 feet **Mean depth when full**: 4.7 feet
Lake elevation observed during the survey: Full
Ordinary high water mark elevation: 1,669.0 **Date set:** October, 1981
Outlet elevation: 1,668.4 **Date set:** October, 1981
Contour map available? Yes **Date prepared:** 2002
Beneficial use classification(s): (6) warmwater semipermanent fish propagation and irrigation (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Herman is listed as a meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish, and Parks (GFP) owns and manages a State Park on the east side of the lake and a Lake Access Area on the west side. The remainder of the shoreline is privately owned and heavily developed.

Fishing Access

Lake Herman State Park contains a double lane boat ramp with a dock, picnic tables, comfort stations, full service and primitive campgrounds. There are many areas suitable for shore fishing. The West Lake Access Area contains a single lane boat ramp with a dock and a public toilet. Shoreline access is limited.

Field Observations of Water Quality and Aquatic Vegetation

The water in Lake Herman was more clear than usual with a Secchi depth measurement of 1.07 meter (42 inches). Very little submerged vegetation was present. Some common cattail can be found in the northwest and south bays.

BIOLOGICAL DATA

Methods:

Lake Herman was sampled on June 18-20, 2007 with four overnight gill-net sets and 10 overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on September 18, 2007 to evaluate walleye recruitment. Sampling locations are displayed in Figure 5.

Results and Discussion:

Gill Net Catch

The gill-net catch was comprised mostly of white suckers (41.1%), walleye (32.1%), and yellow perch (11.6%) (Table 1). White bass, black bullhead, northern pike, bigmouth buffalo, and common carp were also sampled.

Table 1. Total catch from three overnight gill net sets at Lake Herman, Lake County June 18-20, 2007.

Species	#	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
White Sucker	46	41.1	15.3	±6.0	8.0	100	93	93
Walleye	36	32.1	12.0	±2.7	36.5	8	3	86
Yellow Perch	13	11.6	4.3	±2.4	20.5	100	69	100
White Bass	8	7.1	2.7	±3.4	0.0	--	--	--
Black Bullhead	5	4.5	1.7	±1.1	15.8	--	--	--
Northern Pike	2	1.8	0.7	±0.4	0.2	--	--	--
Bigmouth Buffalo	1	0.9	0.3	±0.4	0.8	--	--	--
Common Carp	1	0.9	0.3	±0.4	5.9	--	--	--

* 11 years (1991, 1992, 1994-1998, 1999, 2001, 2003, 2005)

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Trap Net Catch

Black bullhead dominated the trap-net catch (49.8%, Table 2). Nine other fish species were also sampled.

Table 2. Total catch from ten overnight trap net sets at Lake Herman, Lake County, June 18-20, 2007.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	322	49.8	32.2	±12.9	140.0	41	11	88
White Sucker	124	19.2	12.4	±4.9	8.0	99	98	88
Black Crappie	59	9.1	5.9	±1.5	10.6	97	15	104
Bigmouth Buffalo	58	9.0	5.8	±1.9	11.6	98	2	92
Walleye	50	7.7	5.0	±2.6	0.0	14	0	87
Northern Pike	10	1.5	1.0	±0.3	1.3	100	0	79
Common Carp	6	0.9	0.6	±0.4	5.1	--	--	--
Yellow Perch	6	0.9	0.6	±0.4	0.7	--	--	--
White Bass	6	0.9	0.6	±0.3	0.0	--	--	--
Bluegill	5	0.8	0.5	±0.3	0.1	--	--	--

0.□ 10 years (1991, 1992,1994-1997, 1999, 2001, 2003, 2005)

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 20, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

Walleye gill-net CPUE and PSD were similar to 2005 (Table 3) but remain well below our management objective. Most sampled fish were from the 2005 year class and they averaged 27.5 cm (almost 11 inches; Figure 1) in length. Growth of two year old walleyes was similar to statewide, regional and large lake means (Table 4).

The absence of larger walleyes in our survey was disappointing based on the high abundance of yearlings observed in the 2004 fall electrofishing survey. Annual creel surveys suggest that walleye harvest or exploitation was not excessive during the last three years. Therefore, we would expect to see a larger number of older walleyes in the survey. Possible explanations for the low numbers of older walleyes in the survey include high natural mortality, high exploitation during periods outside of the creel survey (just after ice-out) and emmigration.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 1998-2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Mean*
CPUE	31.8	10.2		4.7		20.0		11.5		12.0	25.1
PSD	8	9		25		40		5		8	16
RSD-P	2	4		0		3		3		3	2
Mean Wr	79	85		85		94		87		86	86

*7 years (1996-1999, 2001, 2003, 2005)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Lake Herman, Lake County, 2007.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	2	31	154	275						
2004	3	1	127	254	340					
2003	4	3	165	255	324	361				
2000	7	1	210	395	507	554	579	604	637	
All Classes		**36**	**156**	**276**	**364**	**409**	**579**	**604**	**637**	
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Fall electrofishing indicated a moderately-strong year class was created by the stocking of 1.4 million walleye fry in 2007 (Table 13). The stocked fry were marked with oxytetracycline (OTC) to evaluate stocking success and marks were found on the of 94% of the 50 fish examined. The stocked walleyes in Lake Herman were much smaller than naturally-produced fish and those that migrated to Lake Madison. This indicates a significant food shortage occurred sometime after the fry were stocked.

Table 5. Age-0 and age-1 walleyes sampled by nighttime electrofishing on Lake Herman, Lake County, 1996-2007.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2007	fry	117	81-141	94	104 (86-207)	90	0			
2006	none	0					47	6-86	271 (229-325)	90
2005	fry	142	68-216	100	155 (111-192)	87	0			
2004	none	1	0-2		151 (146-155)	86	54	37-70	241 (207-280)	83
2003	fingerling	293	166-419	100	160 (125-187)	92	0			
2002	none	0					7	0-15	311 (277-341)	104
2001	none	133	110-157		158 (122-184)	91	9	5-13	283 (198-314)	87
2000	fry	35	21-49	[1]	167 (142-195)	91	0			
1999	none	5			200 (192-212)		65			
1998	fry	72		99	145 (106-178)		104			
1997	fry	93		100	149 (121-182)		11			
1996	fry	24		100	144 (125-163)		247			

[1] No evaluation done.

Yellow Perch

Management objective: Maintain a gill-net CPUE of at least 50 with a PSD range of 30-60.

Yellow perch gill net CPUE continues to decrease and is far below our management objective (Table 6). Recruitment has been very low for the last six years, which has been common on many Region III lakes. The sample was comprised entirely of larger individuals (Figure 2) that were in very good condition (Table 6).

Table 6. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 1998-2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Mean*
CPUE	57.3	10.2		18.3		28.0		13.0		4.3	20.9
PSD	93	9		83		96		86		100	67
RSD-P	66	51		5		10		74		69	31
Mean Wr	104	85		104		107		101		100	103

*7 years (1996-1999, 2001, 2003, 2005)

Black Crappie

Management objective: Maintain a black crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

Black crappie trap net CPUE in 2007 was up from 2005 and similar to 2003 (Table 7). The fish sampled were in excellent condition and ranged in length from 19-31.5 cm (7.5-12.4 in) (Figure 3) with a mean length of 232 mm (9.1 in).

Table 7. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 1999-2007.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	Mean*
CPUE	1.1		16.3		4.4		0.2		5.9	8.3
PSD	--		82		98		--		97	94
RSD-P	--		1		7		--		15	19
Mean Wr	--		108		113		--		104	111

*6 years (1996-1997, 1999, 2001, 2003, 2005)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of no more than 100.

Black bullhead trap net CPUE increased in 2007 (Table 8), but is still within our management objective. Several year classes and a wide range of lengths were found in Lake Herman this year. Bullhead size structure was reasonably good with over 40% of the catch measuring over 23 cm (9 in), the minimize size typically harvested by anglers. (Figure 4).

Table 8. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 1999-2007.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	Mean*
CPUE	74.9		30.2		480.4		21.3		32.2	187.9
PSD	87		95		91		97		41	70
RSD-P	32		40		6		60		11	23
Mean Wr	--		--		100		94		88	97

*6 years (1996-1997, 1999, 2001, 2003, 2005)

All Species

White bass were first sampled in 2007, but were first reported in the creel survey in 2006 (Tables 9 and 11). Numbers of bluegill, northern pike, white sucker and common carp have remained relatively constant (Table 9)

Table 9. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Herman, Lake County, 1998-2007.

Species	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
COC (GN)	2.0	1.0		2.0		0.3		0.5		0.3
COC (TN)	--	2.0		2.5		0.9		0.4		0.6
WHS (GN)	6.0	7.6		5.3		14.0		13.8		15.3
WHS (TN)	--	8.4		17.1		6.7		1.2		12.4
BIB (GN)	0.5	0.2		--		--		5.8		0.3
BIB (TN)	--	2.2		5.8		1.2		99.4		5.8
BLB (GN)	5.3	4.4		1.7		21.8		0.5		1.7
BLB (TN)	--	74.9		30.2		480.4		21.3		32.2
CCF (GN)	--	--		--		--		--		--
CCF (TN)	--	--		--		--		0.1		--
NOP (GN)	0.8	0.4		--		1.5		--		0.7
NOP (TN)	--	0.7		0.9		0.4		0.2		1.0
WHB (GN)	--	--		--		--		--		2.7
WHB (TN)	--	--		--		--		--		0.6
GSF (GN)	--	--		--		--		--		--
GSF (TN)	--	--		--		0.4		--		--
BLG (GN)	--	--		--		--		--		--
BLG (TN)	--	0.4		--		0.1		--		0.5
SMB (GN)	--	--		--		--		--		--
SMB (TN)	--	--		--		0.1		0.1		--
BLC (GN)	--	--		--		--		--		--
BLC (TN)	--	1.1		16.3		4.4		0.2		5.9
YEP (GN)	57.3	10.0		18.3		28.0		13.0		4.3
YEP (TN)	--	0.3		5.1		1.8		--		0.6
WAE (GN)	31.8	10.2		4.7		20.0		11.5		12.0
WAE (TN)	--	5.4		2.3		1.2		--		5.0

COC (Common Carp), WHS (White Sucker),BIB (Bigmouth Buffalo), BLB (Black Bullhead),CCF (Channel Catfish), NOP (Northern Pike), WHB (White Bass), GSF (Green Sunfish), BLG (Bluegill), SMB (Smallmouth Bass), BLC (Black Crappie), YEP (Yellow Perch), WAE (Walleye),

Creel Survey Results

Summer fishing pressure was at a 10-year low and has steadily declined since 2001(Table 11). . The highest fishing pressure occurred in June (1,857 hours) and only 417 hours of fishing were estimated for August. About 61% of the fishing was done by boat and 63% occurred on the weekends. Nearly 74% of parties interviewed were targeting walleyes and 94% were South Dakota residents.

Table 11. Estimates of fishing pressure and catch (harvest) of fish on Lake Herman from May through August, 1998-2007.

Year	Pressure (h)	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	White Bass Catch (Harvest)	Black Bullhead Catch(Harvest)
2007	4,229	1,441 (601)	285 (54)	359 (312)	67 (51)	1,166 (974)
2006	5,114	987 (377)	34 (0)	93 (93)	790 (419)	1,182 (724)
2005	6,074	2,363 (133)	20 (0)	37 (37)	0 (0)	219 (0)
2004	8,259	2,806 (845)	99 (31)	896 (871)	0 (0)	3,785 (1,997)
2003	11,189	3,840 (2,760)	259 (104)	231 (231)	0 (0)	15,504 (11,282)
2002	11,837	2,528 (1,190)	189 (12)	1,221 (797)	0 (0)	10,850 (2,597)
2001	14,265	2,545 (1,114)	209 (27)	285 (194)	0 (0)	463 (463)
2000	11,483	3,048 (1,328)	35 (0)	1,821 (571)	0 (0)	3,684 (2,503)
1999	5,038	4,962 (195)	0 (0)	743 (489)	0 (0)	2,602 (1,157)
1998	17,128	15,246 (998)	405 (294)	1,736 (1,154)	0 (0)	8,588 (6,140)

Walleye catch and harvest rates were higher than in 2006 (Table 12). The harvest rate of 0.14 fish/h indicated a reasonably good fishery and approaches our target harvest rate of 0.15 fish/h for walleye fisheries in Region III. Most of the walleyes were harvested in June and about 50% of the overall fish harvested measured 35.6 cm (14 inches) or longer. It is a little surprising that this walleye fishery did not attract more anglers; however, summer and fall fishing pressure was also lower on Lake Madison this year even though there was much better yellow perch fishing than in 2006.

Yellow perch catch and harvest improved modestly over the preceding 2 years (Table 11). Most of the yellow perch harvested were large (25-35 cm; 10-14 inches) and were caught by anglers targeting walleyes.

White bass harvest was first documented in 2006 (Table 11). Harvest declined from an estimated 419 fish in 2006 to 51 in 2007. Most of the white bass harvested were 33-36 cm (13-14 inches) long.

Catch and harvest rates for black bullheads increased from the two preceding years. Anglers harvested nearly 84% of the bullheads they caught with the majority of fish measuring 23-31 cm (9-12 inches) long.

Table 12. Number of interviews and estimates of catch and harvest rates (number/hour) on Lake Herman from May through August, 1998-2007.

Year	Number of Interviews	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	White Bass Catch (Harvest)	Black Bullhead Catch (Harvest)
2007	53	0.34 (0.14)	0.07 (0.07)	0.08 (0.07)	0.02 (0.01)	0.28 (0.23)
2006	86	0.19 (0.07)	0.007 (0)	0.02 (0.02)	0.15 (0.08)	0.23 (0.14)
2005	114	0.39 (0.02)	0.003 (0)	0.006 (0.006)	0 (0)	0.04 (0)
2004	128	0.34 (0.10)	0.01 (0.004)	0.11 (0.11)	0 (0)	0.46 (0.24)
2003	115	0.34 (0.25)	0.02 (0.02)	0.02 (0.02)	0 (0)	1.39 (1.01)
2002	162	0.21 (0.10)	0.02 (0.001)	0.10 (0.07)	0 (0)	0.92 (0.22)
2001	121	0.18 (0.08)	0.01 (0.002)	0.02 (0.01)	0 (0)	0.03 (0.03)
2000	127	0.27 (0.12)	0.003 (0)	0.16 (0.13)	0 (0)	0.32 (0.22)
1999	96	0.98 (0.04)	0 (0)	0.15 (0.10)	0 (0)	0.52 (0.23)
1998	171	0.89 (0.06)	0.02 (0.02)	0.10 (0.07)	0 (0)	0.50 (0.36)

COMMON CARP STUDY

South Dakota State Graduate Student, Matthew Hennen, is conducting a Master's study to assess the population dynamics of common carp in Lakes Herman, Madison and Brant. His research will evaluate carp biomass, movement, growth and recruitment.

During May 2007, SDSU students and Region III SDGFP personnel electrofished to tag 896 common carp on Lake Herman. A week of electrofishing was also done in June to recapture tagged fish for a population estimate. The population was estimated at 44,581 (80% C.I.: 30,212-64,331) and 64,780 (39,791-117,231) or about 300-400 pounds/acre using Schnabel and Peterson estimators, respectively.

A much larger number of tagged carp were recaptured during an extensive commercial fishing operation during fall 2007. Commercial fishermen harvested approximately 29,000 common carp weighing an estimated 300,000 pounds. Staff retrieved 215 tags (25% of the total tagged sample) from this catch. From this sample, population size was estimated at 120,000 (90% C.I. : 108,000-132,000) or about 800-1,000 pounds/acre.

MANAGEMENT RECOMMENDATIONS

1. Walleye fry or fingerlings will be stocked when natural production is insufficient as determined by annual fall electrofishing. The walleye population will be monitored through biennial netting and annual summer creel surveys. No stocking is recommended in 2008.

2. Continue with development of a habitat improvement plan that will benefit panfish and walleye reproduction, increase survival of young fish, reduce the number of rough fish, and improve water quality.

3. Experiment with carp barriers to protect vegetation for panfish spawning and rearing.

Table 13. Stocking record for Lake Herman, Lake County, 1991-2007.

Year	Number	Species	Size
1991	41,640	Yellow Perch	Fingerling
	17,800	Walleye	Lrg. Fingerling
	6,421	Walleye	Med. Fingerling
1992	170,000	Saugeye	Sml. Fingerling
	145	Walleye	Lrg. Fingerling
	162,500	Yellow Perch	Fingerling
1993	67,500	Saugeye	Sml. Fingerling
	67,500	Walleye	Sml. Fingerling
1995	41,000	Fathead Minnow	Adult
	135,000	Walleye	Fingerling
1996	2,707,000	Walleye	Fry
	136,840	Yellow Perch	Fingerling
1997	2,700,000	Walleye	Fry
1998	2,700,000	Walleye	Fry
1999	13,572	Yellow Perch	Adult
2000	126,474	Walleye	Fingerling
	2,800	Yellow Perch	Adult
2003	137,620	Walleye	Fingerling
2005	2,000,000	Walleye	Fry
2007	1,400,000	Walleye	Fry

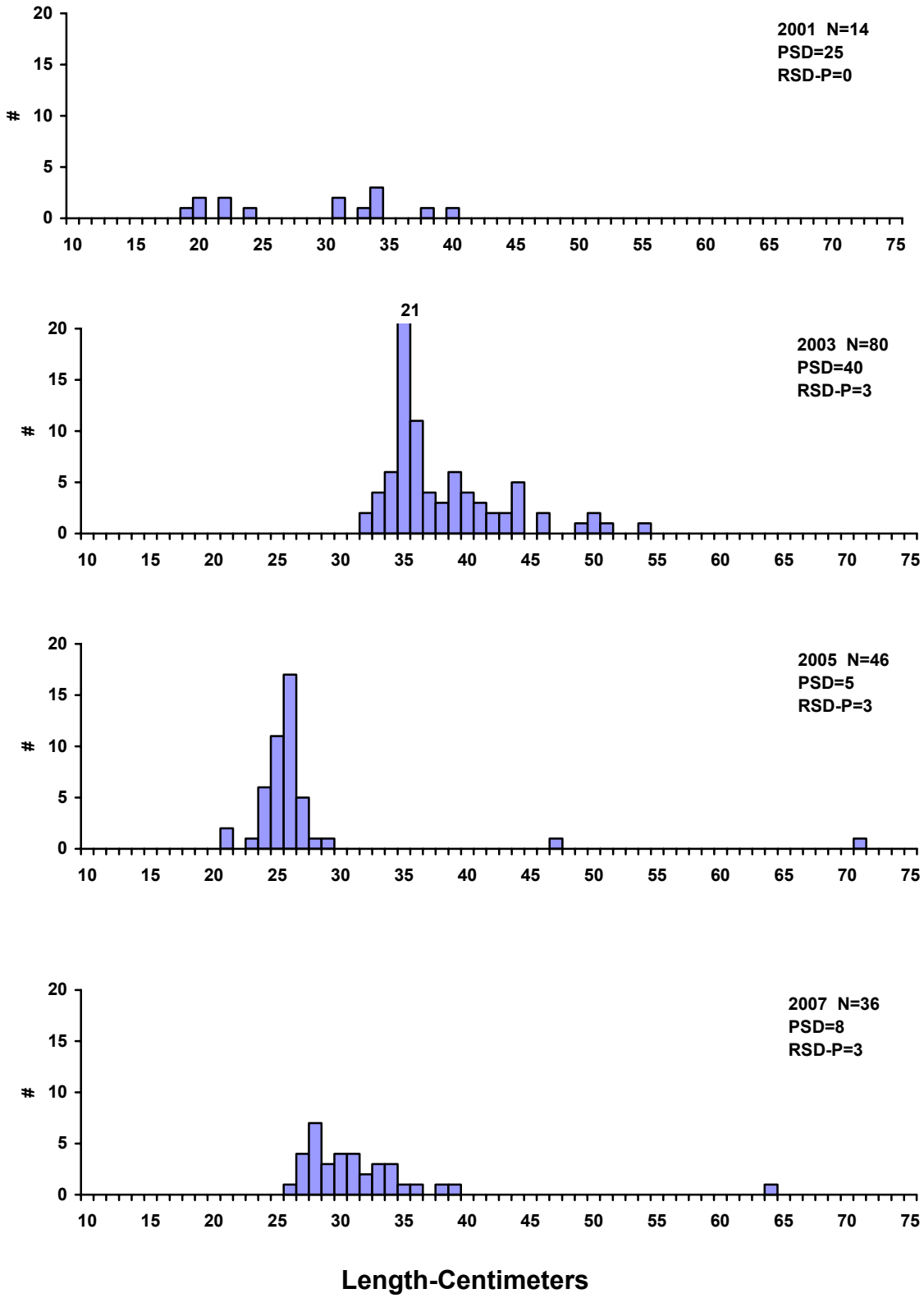

Figure 1. Length frequency histograms for walleye sampled with gill nets in Lake Herman, Lake County, 2001, 2003, 2005, 2007.

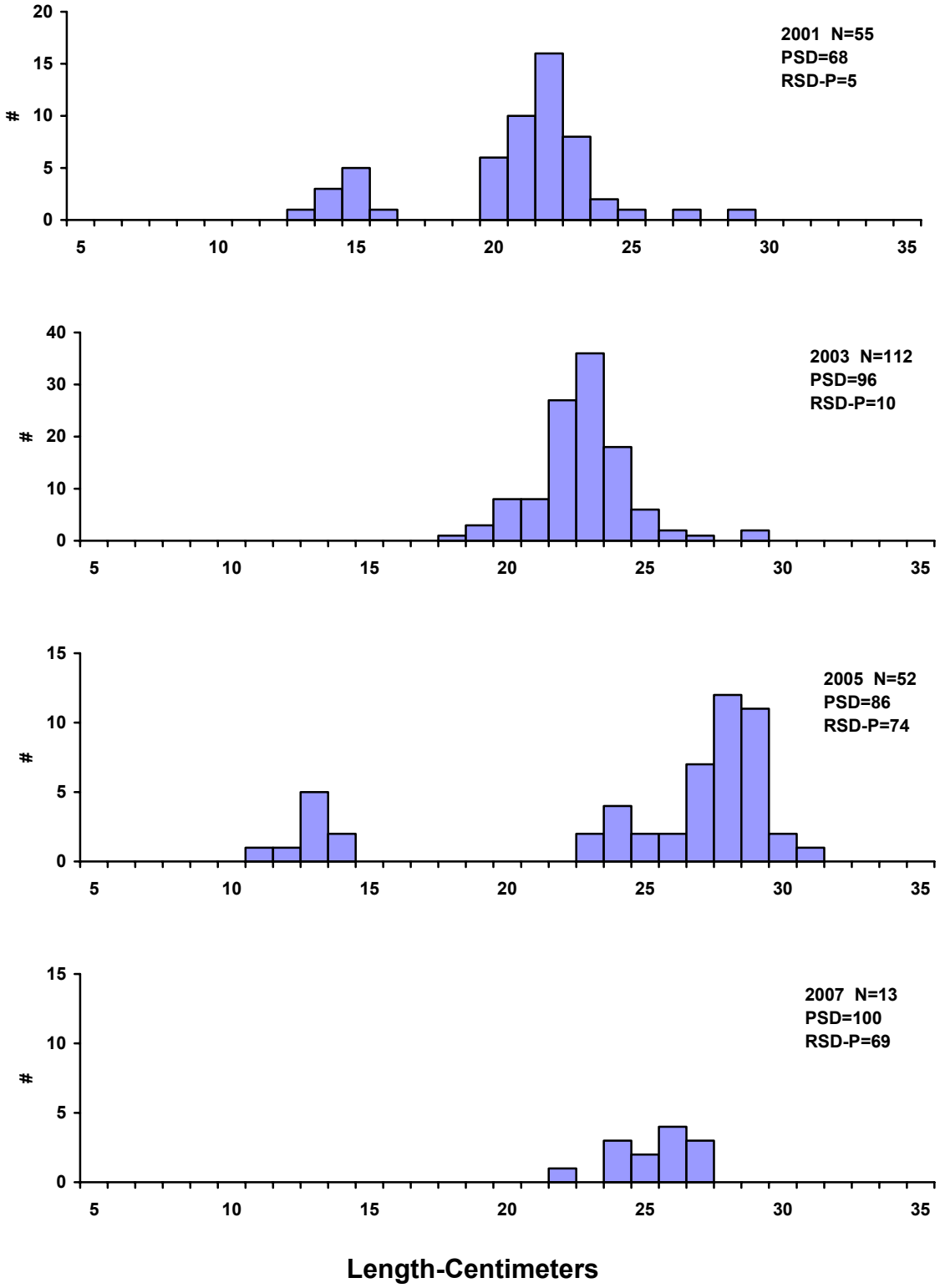

Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Lake Herman, Lake County, 2001, 2003, 2005, 2007.

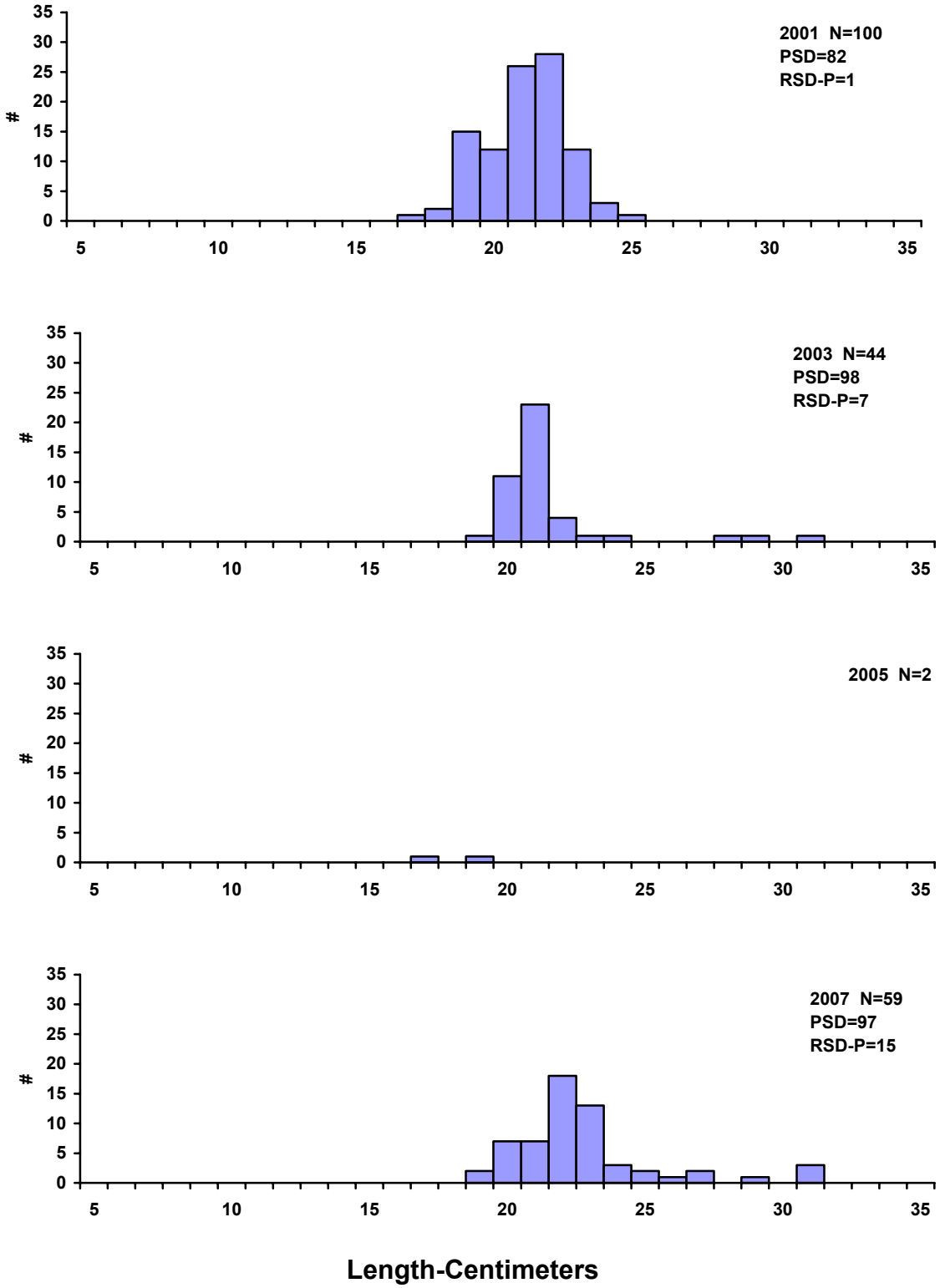

Figure 3. Length frequency histograms for black crappies sampled with trap nets in Lake Herman, Lake County, 2001, 2003, 2005, 2007.

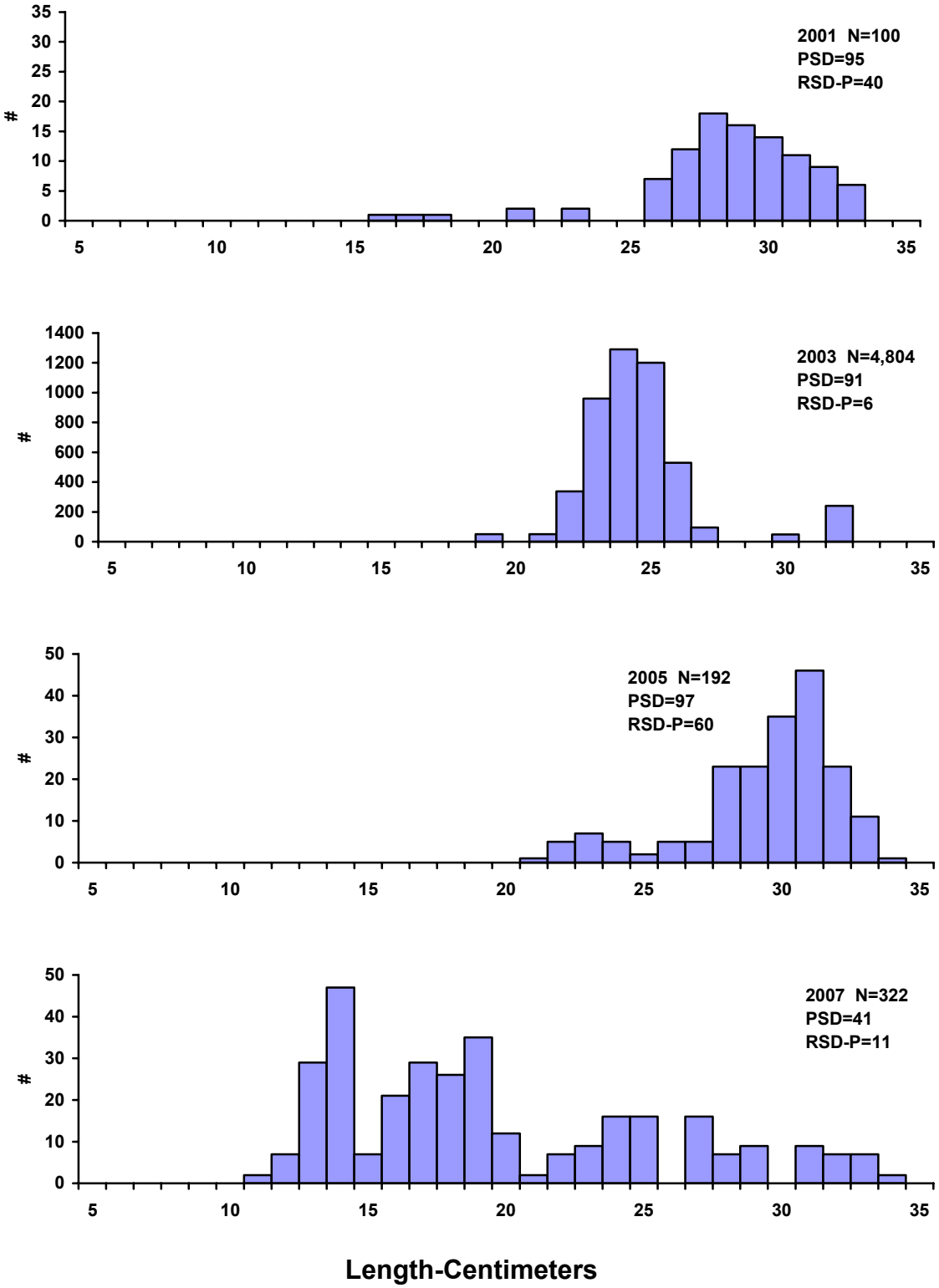

Figure 4. Length frequency histograms for black bullheads sampled with trap nets in Lake Herman, Lake County, 2001, 2003, 2005, 2007.

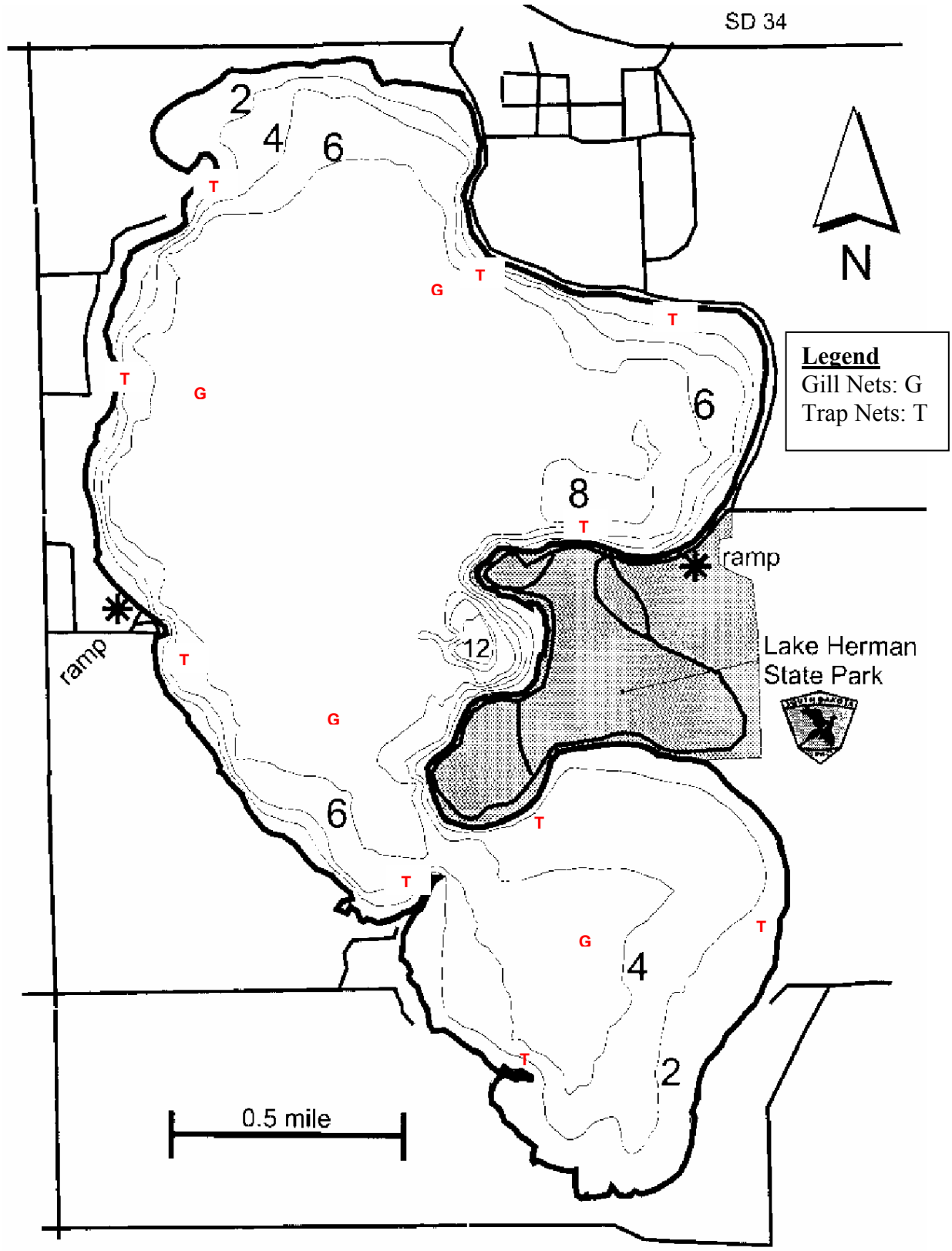

Figure 5. Sampling locations on Lake Herman, Lake County, 2007.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.